

**Mumbai University**

**Question Paper**

**[IDOL – REVISED COURSE]  
(APRIL – 2013)**

**PAPER - II**

**DIGITAL**

**SIGNALS AND SYSTEMS**

Time: 3 Hours

Total Marks: 100

N.B.: (1) All Question are Compulsory.

(2) Make Suitable Assumptions Wherever Necessary And State The Assumptions Made.

(3) Answer To The Same Question Must Be Written Together.

(4) Number To The Right Indicates Marks.

(5) Draw Neat Labeled Diagrams Wherever Necessary.

(6) Use of Non – Programmable Calculator is allowed.

**Q.1 ATTEMPT ANY TWO QUESTIONS: (10 MARKS)**

- (A) What is signal processing? What is Digital Signal Processing? (5)
- (B) State and explain Inverse Laplace Transform. (5)
- (C) State any five properties of z-Transform. (5)
- (D) What is Digital Filter? State the advantages of Digital Filters. (5)

**Q.2 ATTEMPT ANY THREE QUESTIONS: (15 MARKS)**

- (A) Discuss advantages of Digital Signal Processing (DSP) over Analog Signal Processing (ASP). (5)
- (B) What is Even and ODD Signal? Determine even and odd components of  $x(t) = \cos t + \sin t$ . (5)
- (C) Write note on Quantization. (5)
- (D) State and prove Parseval's theorem. (5)
- (E) Any five Properties of Fourier transform. (5)
- (F) Explain Dirichlet's conditions. (5)

**Q.3 ATTEMPT ANY THREE QUESTIONS: (15 MARKS)**

- (A) Laplace transform of  $t \sin at$ . (5)
- (B) Properties of Laplace Transform. (5)
- (C) Final Value theorem in Laplace transform. (5)
- (D) Laplace transform of Cosine function. (5)
- (E) Laplace transform for Impulse Response of Series R-C Circuit. (5)
- (F) Region of Convergence of Laplace transform. (5)

**Q.4 ATTEMPT ANY THREE QUESTIONS: (15 MARKS)**

- (A) Explain Z-Transform? (5)
- (B) Determine the convolution of the two sequences  $x(n) = \{2, 1, 0, 0, 5\}$  and  $h(n) = \{2, 2, 1, 1\}$  (5)
- (C) Explain Final Value Theorem. (5)
- (D) Explain z-Transform. (5)
- (E) Z-Transform of  $x(n) = 2^n u(n - 2)$  (5)
- (F) Important properties of the ROC for the z-Transform. (5)

**Q.5 ATTEMPT ANY THREE QUESTIONS: (15 MARKS)**

- (A)  $F[x(n)] = [x(n)]^2$  (5)
- (B) Explain Linearity. (5)
- (C) Show that the system described by the differential equation  $\frac{dy(t)}{dt} + 10y(t) = x(t)$  is non-linear. (5)
- (D) NA (5)
- (E) Solve:  $y(n) = ax(n) + b$  (5)
- (F) Explain Frequency Response. (5)

[TURN OVER]

**Q.6 ATTEMPT ANY THREE QUESTIONS: (15 MARKS)**

- (A) Given  $x(n) = \{0, 1, 2, 3, 4, 5, 6, 7\}$ , find  $X(k)$  using DIT FFT Algorithm. (5)
- (B) Relationship of the DFT to the z-transform. (5)
- (C) Find the N-Point DFT for  $x(n) = a^n$  for  $0 < a < 1$ . (5)
- (D) NA (5)
- (E) NA (5)
- (F) NA (5)

**Q.7 ATTEMPT ANY THREE QUESTIONS: (15 MARKS)**

- (A) NA (5)
  - (B) NA (5)
  - (C) NA (5)
  - (D) NA (5)
  - (E) Explain Elliptic Filters. (5)
  - (F) Determine the unit sample response of the ideal low pass filter. Why is not realizable? (5)
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